International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 04 Issue: 04 | April -2020 ISSN: 2582-3930

IOT BASED SMART HOME GARDEN WATERING SYSTEM

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Abstract -The need of every human being in this world is oxygen. Plants have been playing a vital role in balancing the oxygen and carbon dioxide content in the environment. Number of plants are being destroyed each and every day for the urbanization process. The number of plantings made are also reduced. In inclusion to this more plants suffer due to lack of maintenance. The main objective of this IOT based gardening system is to maintain the environmental nature of the plants by continuously monitoring the parameters such as moisture level, temperature and water level.
The development of the automation systems for the motor on/off once the level of the water is high. An Android application is developed which is easily used to monitor the parameters of the garden and automate the watering process. Arduino is used to connect different sensors which collect the parameters of soil and transmit the information to the server through NodeMCU Wi-Fi model.

Key Words: IOT, NodeMCU, ESP8266, Arduino Microcontroller, Temperature sensor, Smart Garden, Moisture sensor, Pressure sensor, Motor.

1.INTRODUCTION

In today's world automation is omnipresent. It is the technique of using the computer, tablet and mobile phones in monitoring and controlling the simple parameters such as (emergency notification) of day to day life. Our standard of living will be highly impacted by using automation for all the simple things in life. Using the idea of IOT, we enable sensors that communicate with each other and are powerful in automation. An important aspect of this prototype is that it saves the cost and ensures safety. When people try to make plantings and set up their own garden, they are cautious of maintenance only in their beginning stages.

As the days pass away, due to lack of maintenance, the plants get destroyed. This prototype will help people to automatically monitor the parameters and ensure maintenance of the garden. The role it plays is vital and proves to be a good companion for thelittle plants. The feild of IOT has been providing solutions for a large variety of problems, and it gives us theadvantage thatthings or events can be sensed or controlled remotely in network infrastructure.

2.PROBLEM STATEMENT

The problem that this system looks at is that even though plants provide good health to us, quality air with almost all the basic needs for the survival of human beings, still we are unable to give the plant with its basic needs, like limited water, non-polluted oxygen and as a result, plants are unable to survive. In the automated world, our automatic systems are more preferred than the manual system.

The Existing System provides a manual way for android applications, protecting a garden in terms of environmental situation and the database ending with proper recovery options. The proposed system designs an idea of a breakdown model to test the automatic gardening system of the android application along with its database in every step.

3.RELATED WORK

In [1], the system uses Arduino and ESP8266 based monitored controlled and cost-effective smart irrigation systems. The system also has various sensors ph sensor, water flow sensor, pressure sensor, temperature and soil moisture sensor. Arduino receives the information and transmits it to the website with ESP8266 Wi-Fi-module by using internet. Users can also control the water pumps and sprinklers with the help website. The monitoring of transmitted information is done with the help of IOT.

In [2], the system uses the Intel Galileo that employs the integration of cloud networking, wireless communication, to provide the user with remote control of various lights, fans, and appliances inside their home and of course storing all data in the provided cloud. The system automatically changed on the pretext of sensor

data. The system designed here monitors different types of sensor data, like temperature, gas, light, motion sensors, but also takes action with the help of actuator and starts a process according to the processed result, for example switching on the light when it gets dark. It will also store all the sensors parameters in the cloud (Gmail) in a time-efficient manner. This helps the users to get a quick analysis of the condition of various parameters inside the house anytime anywhere.

In [3], the system is designed for automatic water supplying system in farmland using raspberry pi 3, Arduino microcontrollers, WIFI module, GSM shield, relay boards and sensors. This system can detect the exact time of water supply for the trees and can also keep a track of water level to prevent water from being wasted or being accumulated near the roots of the tree.

In [4], the system has a distributed wireless network of soil-moisture & temperature sensors placed in the root zone of plants, this also shows the potentials of a smart indoor gardening and cultivating system that forms a link between gardening activities and the IoT smart technologies. The benefits of gardening have been emphasized to improve the quality of life.

In [5], the architecture and the main implementation of this system mainly consists of two types of sensor motes (TelosB and IRIS), soil humidity sensors and electro-valves and also java application used for the data collection. The system also manages to regularly maintain the soil and humidity levels.

In [6] the system uses Internet of Things by connecting various parameters of the soil to the cloud and is also being controlled remotely through an android app. It also uses ultrasonic sensors and also actuate other parameters according to the need of the user.

4.PROPOSED METHODOLOGY

Pseudo code:
Step 1: Start.

Step 2: Initialize the system on Arduino.

Step 3: The moisture sensor constantly checks moisture and humidity.

Step 4: The soil moisture sensor checks the soil moisture level constantly

Step 5: The Wi-Fi Model (ESP) sends the value continuously to the server for
analysis of upcoming sensor values

Step 6: All the sensors constantly sense the temperature and humidity of the
field and update the date in the web server.

Step 7: If the water level reduces to a value lower than the permissible level, the
relay which is connected to the Arduino will turn on the motor.

Step 8: Similarly, if the soil becomes dry, the motor which is connected to the
relay will be turned on to wet the field.

Step 9: If step 8 is completed, it will go to step 4.
Step 10: Similarly, if the step 7 is over, the command will go to the step 3.

5.PROPOSED SYSTEM

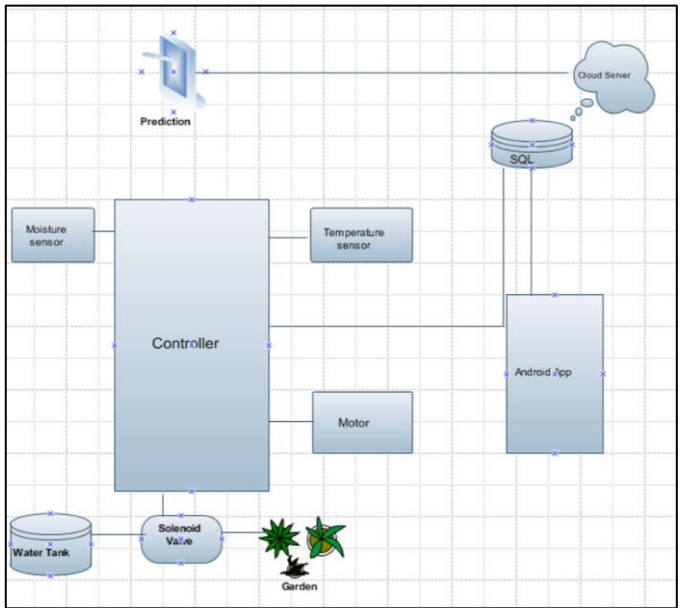

Fig -1: Architecture

The system architecture consists of different sensors like temperature, soil moisture, and a motor pump. Initially the esp8266 connects to the internet through Wi-Fi. When the connection is established, it will start reading the parameters of sensors which are connected to the controller. The threshold levels which are set in programming for the analysis of current required sensors. The sensor data is sent from an android application to the web server and stored in the global cloud. The coming sensor data can be analysed anywhere at any time from the android application. If the sensor values are greater than the set value, i.e. threshold

level then the respective notification will be sent to the user and the required action will be done for the controlling of the parameters.

In the proposed model a temperature, moisture, water level in the house are monitored. The temperature and moisture percentage detection are stored in the cloud for analysis. If the soil moisture value is above the moisture level then the motor will be OFF, whereas if the moisture level is low, the motor will be ON, through the relay.

6. MODULES

1. Registration

Any user can register easily in our android application. We will store all needed data of the user, so that only authorized users can use the application in this system feature.

2. Authentication

Only registered users can use our featured system, so this authentication feature is very important to step in our application.

3. Connect with Hardware

After authentication, by using our mobile app the user can connect with the controller to sense the sensors values.

4. Prediction

After fetching the all sensor values our system will predict the how many needs to the gardening crop moisture, temperature to protect them.

7.SET THEORY

1. Let S = { } be an Automated Gardening System

2. Verify User U

U = {uid, pwd}

Where uid = unique Mobile no. for specific user

pwd = Password Phrase

S = {U}

3. Verify Admin A

A = {uid, pwd}

Where uid = unique Mobile no. for specific user

pwd = Password Phrase

S = {U,A}

4. Verification of 'n' User

U_{db}= $\{u_1,u_2\ldots\ldots\ldots\ldots,u_n\}$

Where u_1 is an Automated Gardening System

$U_1 \in U_{db}$

S = $\{U,A,U_{db}\}$

5. Obtain T_{db}, T_{db} is a Temperature Sensor Value

$T_{db} = \{t_1,t_2,\ldots\ldots,t_n\}$

Where t_1 is instantaneous temperature value

S = $\{U,A,U_{db},T_{db}\}$

6. Obtain M_{db}, M_{db} is a Moisture Sensor Value

$M_{db} = \{m_1,m_2,\ldots\ldots,m_n\}$

Where m_1 is instantaneous moisture value

S = $\{U,A,U_{db},T_{db},M_{db}\}$

7. Obtain P_{db}, P_{db} is a Pressure Sensor Value

$P_{db} = \{p_1,p_2,\ldots\ldots,p_n\}$

Where p_1 is instantaneous Pizo value

S = $\{U,A,U_{db},T_{db},M_{db},P_{db}\}$

8. Calculate R_s from T_{db},M_{db},P_{db}

S = $\{U,A,U_{db},T_{db},M_{db},P_{db},R_s\}$

9. Decide Motor Status M_s from R_s

$M_s = \{ON,OFF\}$

10. Final Set

S = $\{U,A,U_{db},T_{db},M_{db},P_{db},R_s,M_s\}$

8.MATHEMATICAL MODEL

1. Identify User

2. Calculate Current Condition R_s w.r.t Threshold level T_H

Where,

T_i=Temperature Sensor Value

M_i=Moisture Sensor Value

P_i=Pressure Sensor Value

3. Motor ON & OFF according to valve

Where M_s holds valve of current status

4. Final Result For Analysis

$$R_F \sum^{n}_{i=1} T_i M_i P_i$$

9.RESULT

This is an automated hardware system consisting of an Android app with two main screens, first a login screen which is followed by the home screen of the app. It consists of a multitude of events for the automation and maintenance of the Smart Garden. The mobile application provides the user the feature to control as well as to monitor the Smart Garden System via locally or remotely. Whenever the value of the sensor crosses the maximum or threshold value it alerts the user by push notifications and allows the user to take control of the system from the remote location and if the user is not available the system monitors the situation and controls it. Being an open source system, it has proven to be a cost-effective system..

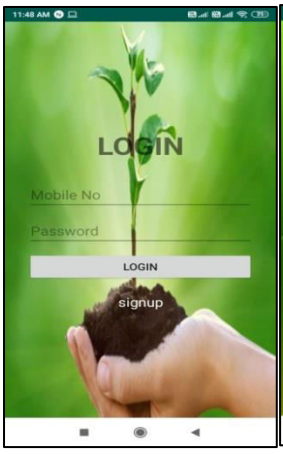

Fig-2.1 Login Page

Fig-2.2 Registration page

Fig-2.3 Analysis Page

10. CONCLUSIONS

The development of a smart garden system, using the Internet of Things by connecting different parameters of soil, temperature, on/off motor to the cloud and was successfully controlled remotely through a mobile application. The proposed system developed not only monitors the sensor data, like moisture, humidity and temperature but also actuates other parameters according to the requirement. This system is automated and is designed to reduce the manual efforts. So automatically, the systems initial cost of installation and maintenance are reduced.

ACKNOWLEDGEMENT

We wish to express our profound thanks to all who helped us directly or indirectly in making this paper. Finally, we wish to thank all our friends and well-wishers who supported us in completing this paper successfully. We are especially grateful to our guide **Prof.Mangal Kotkar** and project coordinator **Prof.Rajesh Tak** for time to time support and valuable guidance. Without the most useful and strengthening support bestowed on us together with cheerful encouragement of our guide, the paper would not have been completed on time or with such meticulous research.

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